Paul B. Fossier, Jr., P.E.
Bridge Engineer Administrator
Louisiana Department of Transportation and Development
Bridge and Structural Design Section
1201 Capitol Access Road, Room 608J
P. O. Box 94245
Baton Rouge, LA 70804-9245
Ph: 225-379-1323, Fax: 225-379-1786
Email: pfossier@dotd.state.la.us
Web site: www.dotd.state.la.us

To: **Mr. Claude Napier, FHWA Virginia Division Office** **From:** Paul Fossier, P.E.

Fax: **Pages:** 9

Phone: 804-775-3363 **Date:** September 30, 2003

Re: **STATE DOT HPC practices** **CC:** [Click **here** and type name]

Urgent X **For Review** **Please Comment** **Please Reply** ☐ **Please Recycle**

Attached is the filled out survey.

HIGH PERFORMANCE CONCRETE QUESTIONNAIRE

Version: 7-15-03

State: Louisiana DOTD

Which of the following changes have been made to your concrete specifications in the last 10 years?

Check those that apply

	Changes Made in Last 10 Years	Included in Current Specifications
Use HPC-low permeability concrete	✓	—
Use HPC-high strength concrete	✓	—
Allow admixtures	✓	—
Concrete strengths	✓	—
Bridge deck curing	✓	—
Deck finishing requirements	✓	✓
Limit cement/alkali content	—	—
Testing and acceptance requirements	✓	✓
Heat of Hydration required for cement	✓	✓
Chloride testing of hardened concrete	—	—
Lightweight concrete	—	—
Self-consolidating concrete (SCC) in use	—	—
Flowing concrete in use	—	—
Epoxy coated reinforcing steel used	✓	✓
Stainl	—	—
Stainless clad reinforcing steel used	—	—
Specify air void parameters (spacing factor and/or specific surface)	—	

2 Current Concrete Specifications

Class of Concrete	Air Content %	Max. W/C Ratio	Slump (in.)	Min. Cement Content (lb/cy)	Max. Cement Content (lb/cy)	Maximum Aggregate Size (in.)
Prestressed	5 2	0.44	2-6	658		1½
Decks	5±1	0.44	2-4			1½
Parapets	5±1	0.44	2-4			1½
Substr./General	5±2		2-4			1½
[illegible]	5±2		2-4			2
Latex Hydraulic Cement Concrete				—	—	—
Silica Fume Concrete						

Use Performance Spec. → based on permeability & strength.

Highest compressive strength used for prestressed concrete girders: 10,000 psi (final), 7,000 psi (release)
Compressive concrete strength used for decks: 4,200 psi

3. All states have experienced some of the below concrete distresses. To what extent has your State experienced these (Rank from 1 to 5 with 1=rare and 5=often):

Type of Distress	1	2	3	4	5
Corrosion of Reinforcing Steel		✓			
Sulfate Attack	✓				
Alkali-silica Reactivity	✓				
Freezing and Thawing	✓				
Cracking (girders, substructure, pvmt)	✓				
Deck Cracking (Early age < 5 years)	✓				
Overload	✓				
Poor Construction Quality	✓				

4. Construction Requirements:
Workability Requirements:

ADMIXTURES AND SLAG USAGE					
ADMIXTURE/SLAG	Non-Aggressive Environment		Aggressive Environment		ELEMENTS WHERE USED All, D, G, P, F, CP, DS*
	YES	NO	YES	NO	
Air-Entraining	✓		✓		D
Retarding	✓		✓		D
Accelerating					
Water Reducing (Normal)	✓		✓		P (Mass Concrete Pours)
Water Reducing (High Range)	✓		✓		P (Mass Concrete Pours)
Water Reducer + Retarder		✓		✓	
Water Reducer + Accelerator		✓		✓	
Viscosity Modifying Admixture		✓		✓	
Silica Fume		✓	✓		D, G, CP (For HPC projects)
Fly Ash, Class F		✓	✓		" " " "
Fly Ash, Class C		✓	✓		" " " "
Fly Ash, Class N		✓		✓	
Metakaolin		✓		✓	
Rice Hull Ash		✓		✓	
Other Ash Materials		✓		✓	

Bark Ash		✓		✓	
Bottom Ash		✓		✓	
Pet Coke Ash		✓		✓	
Slag		✓	✓		For HPC projects D, G, P, CP
Latex		✓	✓		" " " " "
Corrosion Inhibitors		✓		✓	

*Key: Deck(D); Girder(G); Pier(P); Footing(F); Concrete Pile(CP); Drilled Shaft(DS)

ADMIXTURE TYPE & SLAG	RANGE % (Wt. Of Cement Replaced)
Fly Ash	15
Slag	45
Silica Fume	10
Metakaolin	—
Rice Hull Ash	—
Other Ash Materials	—

	Yes	No
Is water allowed to be added at the job site?		✓
Are air-entraining admixtures allowed to be added at the job site?		✓
Are accelerators added at the job site?	✓	
Are there any special finishing requirements?		✓

Explain: _____

_____

Are there any time constraints between finishing and applying curing? ✓

Explain: (Minimum and Maximum Times)_____

_____

CURING REQUIREMENTS						
Structural Element	Exist. Spec. Y/N	Curing Comp. Y/N	Fog Mist Y/N	Wet Burlap Duration	ERL LB/SF/HR	Cure Time (Days)
Deck	Y	Y	Y	7 days	—	7-14
SF Overlay						
Latex Conc. Overlay						
Dense Conc. Overlay						
Paving	N	Y	N	—	—	3
	—	—	—	—	—	—
Shotcrete With SF	—	—	—	—	—	—
Massive Element						

Key ERL= Evaporation Rate Limit (LBS/SF/HR)

Any construction requirements for reducing evaporation?

Yes ✓ No _____

How and how often is evaporation rate measured?

Not done

5. Has fiber-reinforced concrete been specified for bridge decks or overlays and paving (either steel or plastic fibers)(Indicate R = Regular and E = Experimental.)

Bridge Deck

Bridge decks: Yes _____ No ✓ Fiber Type _____

Overlays: Yes ✓ No _____ Fiber Type Steel

Paving: Yes _____ No ✓ Fiber Type _____

6. Identify concrete cover requirements:

MINIMUM CONCRETE COVER REQUIREMENTS		
STRUCTURAL ELEMENT	COVER (in.)	
	Non-Aggressive Environment	Aggressive Environment
Decks – Top	2	2
Decks – Bottom	1	1
Reinforced Concrete Beams	2	2
Prestressed Concrete Beams - CIP	—	—
Prestressed Concrete Beams - Precast	2	2
Substructure – Piers	2	2
Substructure – Abutments	2	2
Substructure - Footings	2	2

REQUIRED REINFORCING STEEL			
STRUCTURAL ELEMENT	TYPE REINFORCING STEEL BS, ECS, GS, SS, SCD, MMFX		
	Non-Aggressive Environment	Aggressive Environment	Experimental Use Only
Decks – Top	BS	ECS	
Decks – Bottom	BS	ECS	
Reinforced Concrete Beams	BS	BS	
Prestressed Concrete Beams, CIP	BS	BS	
Prestressed Concrete Beams, Precast	BS	BS	
Substructure – Piers	BS	BS	
Substructure – Abutments	BS	BS	
Substructure - Footings	BS	BS	

Key: BS = Black Reinforcing Steel; ECS = Epoxy Coated Reinforcing Steel; GS = Galvanized Reinforcing Steel; SS = Stainless Reinforcing Steel; SCD = Stainless Clad Reinforcing Steel; MMFX = MMFX Microcomposite Steel Rebar

7. Is there a limit on the percent of alkali allowed in the cement?

Yes ✓ No _____

8. Are aggregates tested for reactivity?

Yes ✓ No _____ Responsibility of aggregate supplier

How many sources of aggregates?

Ex. DOTD Qualified Product List – ≈ 200 sources

9. Indicate specification permeability requirement limits for:

Structural Element	Coulombs	
	Non-Aggressive Environment	Aggressive Environment
Bridge Decks	—	2000
Prestressed Concrete Members	—	2000
Substructure Elements	—	2000
Pavements	—	—

10 (a): What QC/QA tests do you specify?

Fresh Concrete		Hardened Concrete	
	Tests ✓		Tests ✓
Slump	✓	Compressive Strength	✓
Spread	No	Air/Void System	No
Unit Weight	✓	Chloride Permeability	Yes - HPC
Air Content	✓	Maturity	No
Water Content	No	Freeze/Thaw	No
W/CM	✓	Shrinkage	No
		ASR	No

10 (b): What are your acceptance criteria for cracks?

[redacted]

10 (c): Do you specify pre-construction mock-ups? If yes, provide details.

For HPC decks & girders, we require test pours

10 (d): Do you specify design properties at 28 days or 56 days or some other duration?

Normal Concrete - 28 days, HPC - 56 days.

10 (e): Do you allow 4x8 cylinders for compressive strength tests?

Yes, but normally 6x12, for HPC use match cure 4x8

10 (f): What types of end-caps do you specify/allow – Sulfur, Neoprene, Ground Ends?

Neoprene

10 (g): Do you specify match-cured cylinders?

Yes, for HPC only

10 (h): How do you enforce/monitor wet-water curing?

No

10 (i): Do you require warrantees against defects – e.g. bridge deck cracking?
If yes, provide details.

No - but looking into it

10 (j): What is your experience/evaluation/specification regarding the Microwave Test for w/cm? We have looked at this test, but are not using this test yet

11. How often are the following types of concrete overlays used? (Rank from 1 to 5 with 1=rare and 5=often)

Type of Overlay	1	2	3	4	5	**Comment on Performance** E, G, or P**
Latex-modified Concrete			✓			
Silica Fume Concrete			✓			
Dense Concrete	✓					
Fly Ash Concrete	✓					
Slag Concrete		✓				
Epoxy (Thin Bonded)		✓				
Polymer (Thin Bonded)		✓				
Other	✓					

**Key: Excellent(E); Good(G); Poor(P)

12. Rank the need or interest for your State to learn more about the following from 1 to 5 (1=low; 5=very high)

BENEFICIAL ATTRIBUTES	1	2	3	4	5	**Overall Ranking (1-11)**
Low Permeability (Dense Concrete)		✓				
High Durability		✓				
High Corrosion Resistance			✓			
Alkali-silica Reactivity Resistance				✓		
Higher Concrete Strengths			✓			
Highly Flowable Concrete			✓			
Crack Control			✓			
Skid Resistance			✓			
Rideability			✓			
Toughness of Concrete*			✓			
Minimum Maintenance			✓			
Longer Service Life					✓	
Savings (Life Cycle Costs)				✓		

*Add fibers: steel, glass, plastic, polypropolene, etc.

13. Who at State and Division levels i.e., Materials, Construction, Pavement, Research, Structures, would be involved in examining concrete specifications and procedures and learning about High Performance Concrete?

Check those that apply:
Materials 3
Construction 4
Pavement 5
Structures 2
Research 1

14. Have you considered adopting/implementing the following SHRP products?

A Guide to Determining the Optimal Gradation of Concrete Aggregates?

Yes ____ No ✓ Unknown ____ Implemented ____

Specifications for High Performance Concrete?

Yes ✓ No ____ Unknown ____ Implemented ✓

Designing ASR-Safe concrete Mix?

Yes ____ No ✓ Unknown ____ Implemented ____

Manual for Bridge Rehabilitation and Protection

Yes ____ No ✓ Unknown ____ Implemented ____

Contact Person: Paul Fossier

Address: La. DOTD, Bridge & Structural Design
P.O. Box 94245
Baton Rouge, LA 70804

Telephone No.: 225-379-1323
Email Address: pfossier@dotd.state.la.us

Thank you for completing the questionnaire. A summary of compiled results will be made available upon completion.